

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

1. (Previously Presented) A track pin bushing for cooperating with a track pin in an endless track, the track pin bushing comprising:

a tubular body formed of an iron-based alloy with a first end and a second end, an outer surface that is case-hardened in at least a section thereof, and an inner surface having an inner diameter, wherein the inner diameter defines the circumference of an axial bore extending from the first end to the second end and at least a portion of the outer surface has been removed to a depth sufficient to expose a non-carburized layer of the iron-based alloy; and

a wear-resistant coating metallurgically bonded to said non-carburized layer, the wear-resistant coating comprising a fused, hard metal alloy comprising at least 60% iron, cobalt, nickel, or alloys thereof.

2. (Previously Presented) A track pin bushing for cooperating with a track pin in an endless track, the track pin bushing comprising:

a tubular body formed of an iron-based alloy with a first end and a second end, an outer surface that is case-hardened in at least a section thereof, and an inner surface having an inner diameter, wherein the inner diameter defines the circumference of an axial bore extending from the first end to the second end and at

least a portion of the outer surface has been removed to a depth sufficient to expose a non-carburized layer of the iron-based alloy; and

a wear-resistant coating metallurgically bonded to said non-carburized layer, the wear-resistant coating comprising a fused, hard metal alloy comprising at least 60% iron, cobalt, nickel, or alloys thereof,

wherein said portion of the outer surface that has been removed corresponds to a contact surface adapted to engage with a drive sprocket in the endless track of a track-type machine.

3. (Previously Presented) A track pin bushing for cooperating with a track pin in an endless track, the track pin bushing comprising:

a tubular body formed of an iron-based alloy with a first end and a second end, an outer surface that is case-hardened in at least a section thereof, and an inner surface having an inner diameter, wherein the inner diameter defines the circumference of an axial bore extending from the first end to the second end and at least a portion of the outer surface has been removed to a depth sufficient to expose a non-carburized layer of the iron-based alloy; and

a wear-resistant coating metallurgically bonded to said non-carburized layer, the wear-resistant coating comprising a fused, hard metal alloy comprising at least 60% iron, cobalt, nickel, or alloys thereof,

wherein a Vickers hardness of the wear-resistant coating is greater than 950 HV.

4. (Currently Amended) A track pin bushing for cooperating with a track pin in an endless track, the track pin bushing comprising:

a first end and a second end;

an inner surface having an inner diameter, wherein the inner diameter defines the circumference of an axial bore extending from the first end to the second end;

an outer surface having a varying diameter; and ~~first outer diameter at a first end section and a second end section and a second outer diameter at a middle section therebetween, wherein the second outer diameter is greater than the first outer diameter;~~

~~an annular groove located in at least a portion of said middle section and extending over a majority of an axial length of said middle section; and~~

a wear-resistant coating disposed in ~~said annular groove~~ on a first portion of the outer surface and metallurgically bonded to the track pin bushing, the wear-resistant coating comprising a fused, hard metal alloy comprising at least 60% iron, cobalt, nickel, or alloys thereof,

wherein the wear resistant coating has a thickness of approximately 1.5 mm.

5. (Original) The track pin bushing of claim 4, wherein the wear-resistant coating has an outer surface flush with the outer surface of the track pin bushing.

6. (Currently Amended) The track pin bushing of claim 4, wherein the track pin bushing is an iron-based alloy and at least one of the first end, second end, and inner surface, ~~first section and second section~~ is case hardened.

7. (Currently Amended) The track pin bushing of claim ~~[[4]]~~ 33, wherein the track pin bushing is an iron-based alloy and at least the middle section in which the annular groove is not located is carburized and quenched and the annular groove has a depth sufficient to expose a non-carburized layer of the iron-based alloy.

8. (Canceled)

9. (Original) A method for hardfacing with a wear-resistant coating a metal surface of a carburized metal part, the method comprising the steps of:

removing the carburized metal from at least a portion of the metal surface to a depth sufficient to expose a non-carburized layer of the metal, the portion defining an area to be coated;

coating the area with a slurry comprising a fusible, hard metal alloy with at least 60% iron, cobalt, nickel, or alloys thereof in the form of a finely divided powder and polyvinyl alcohol; and

forming a metallurgical bond between the area and the coated slurry to form the wear-resistant coating.

10. (Original) The method of claim 9, wherein the step of removing comprises one or more of machining, lathing, grinding, and polishing.

11. (Original) The method of claim 9, further comprising a step of:
adjusting a thickness of the coated slurry to an unfused thickness of
from 1.67 to 2.0 times a final (i.e., fused) thickness of the wear-resistant coating.
12. (Original) The method of claim 9, wherein the step of forming a
metallurgical bond comprises drying the coated slurry, heating the metal part to a
fusion temperature of the fusible, hard metal alloy in a controlled atmosphere of at
least one inert gas or reducing gas excluding nitrogen, and cooling the metal part to
ambient temperature.
13. (Original) The method of claim 9, further comprising subsequently
quenching the carburized metal part to case harden the carburized metal that
remains after the step of removing such that a non-coated surface has an increased
hardness as compared to the carburized metal.
14. (Original) The method of claim 9, wherein the metal part is a
component of an endless track or a component of an undercarriage in a track-type
machine.
15. (Original) The method of claim 14, wherein the metal part is a track pin
bushing.

16. (Original) A method for hardfacing a metal surface of a track pin bushing with a wear-resistant coating, the track pin bushing comprising an outer surface having an outer diameter, an inner surface having an inner diameter, a first end and a second end, wherein the inner diameter defines the circumference of an axial bore extending from the first end to the second end and cooperating with a track pin in an endless track, the method comprising the steps of:

carburizing at least a portion of the track pin bushing to produce a surface having a carburized depth;

preparing at least a portion of the carburized surface of the track pin bushing in an area to be coated by removing the carburized metal to a depth sufficient to expose a decarburized layer;

coating the exposed decarburized layer of the track pin bushing with a slurry comprising a fusible, hard metal alloy with at least 60% iron, cobalt, nickel, or alloys thereof in the form of a finely divided powder and polyvinyl alcohol;

forming the wear-resistant coating by metallurgically bonding the exposed decarburized layer and the slurry; and

case hardening a non-prepared and carburized surface of the track pin bushing by quenching.

17. (Original) The method of claim 16, further comprising a step of adjusting a thickness of the slurry to have an outer surface that is concentric with the axial bore, wherein the thickness of the concentric slurry coating is from 1.67 to 2.0 times a final thickness of the wear-resistant coating.

18. (Original) The method of claim 16, wherein the depth is at least 3 mm.
19. (Original) The method of claim 16, wherein the step of preparing comprises removing by one or more of machining, lathing, grinding, and polishing.
20. (Original) The method of claim 16, wherein the step of forming the wear-resistant coating by metallurgical bonding comprises drying the slurry, heating the metal surface of the track pin bushing to a fusion temperature of the fusible, hard metal alloy in a controlled atmosphere of at least one of an inert gas or a reducing gas excluding nitrogen, and cooling the track pin bushing to ambient temperature.
21. (Original) The method of claim 16, wherein the non-prepared and carburized surface is at least one of the inner surface of the track pin bushing, the first end of the track pin bushing, and the second end of the track pin bushing.
22. (Original) A method for hardfacing a metal surface of a track pin bushing with a wear-resistant coating, the method comprising:
 - forming the track pin bushing having a first end and a second end, an inner surface having an inner diameter, wherein the inner diameter defines the circumference of an axial bore extending from the first end to the second end, an outer surface having a first outer diameter at a first end section and a second end section and a second outer diameter at a middle section therebetween, the second outer diameter being greater than the first outer diameter;

carburizing the track pin bushing to produce a carburized outer surface, inner surface and first and second end sections, each with a carburization depth;

removing carburized steel from at least a portion of said middle section to reduce the second diameter by at least the carburization depth,

coating said middle portion in the area of the reduced diameter with a slurry comprising a fusible, hard metal alloy with at least 60% iron, cobalt, nickel, or alloys thereof in the form of a finely divided powder and polyvinyl alcohol;

adjusting a thickness of the slurry to have an outer surface that is concentric with the axial bore, wherein the thickness of the concentric outer surface is from 1.67 to 2.0 times a final thickness of the wear-resistant coating;

forming the wear-resistant coating by metallurgically bonding said portion of said middle portion and the slurry; and

case hardening at least the inner diameter and first and second ends.

23. (Original) The method of claim 22, wherein the carburization depth is approximately 3.0 mm.

24. (Original) The method of claim 22, wherein the step of removing comprises one or more of machining, lathing, grinding, and polishing.

25. (Original) The method of claim 22, wherein the step of forming the wear-resistant coating by metallurgical bonding comprises drying the slurry, heating the metal surface of the track pin bushing to a fusion temperature of the fusible, hard

metal alloy in a controlled atmosphere of at least one of an inert gas or a reducing gas excluding nitrogen, and cooling the track pin bushing to ambient temperature.

26. (Original) A track pin bushing in combination with a track pin for connecting adjacent track links in an endless track of a crawler track, the track pin bushing including an axial bore therethrough in which is positioned the track pin, the track pin bushing comprising:

a tubular body formed of a case hardened iron-based alloy with a first end and a second end, an outer surface, and an inner surface having an inner diameter, wherein the inner diameter defines the circumference of the axial bore extending from the first end to the second end and a portion of the outer surface has been removed to a depth sufficient to expose a non-carburized layer of the iron-based alloy; and

a wear-resistant coating metallurgically bonded to said portion, the wear-resistant coating comprising a fused, hard metal alloy comprising at least 60% iron, cobalt, nickel, or alloys thereof.

27. (Previously Presented) A track pin bushing for cooperating with a track pin in an endless track, the track pin bushing comprising:

a tubular body formed of an iron-based alloy with a first end and a second end, an outer surface that is case-hardened in at least a section thereof, and an inner surface having an inner diameter, wherein the inner diameter defines the circumference of an axial bore extending from the first end to the second end and at

least a portion of the outer surface has been removed to a depth sufficient to expose a non-carburized layer of the iron-based alloy; and

a wear-resistant coating metallurgically bonded to said non-carburized layer, the wear-resistant coating comprising a fused, hard metal alloy comprising at least 60% iron, cobalt, nickel, or alloys thereof,

wherein said portion of the outer surface that has been removed is on a circumferential surface of the outer surface.

28. (Previously Presented) The track pin bushing of claim 27, wherein said portion of the outer surface that has been removed is less than the entire circumferential surface of the outer surface.

29. (Previously Presented) The track pin bushing of claim 27, wherein said portion of the outer surface that has been removed corresponds to a contact surface adapted to engage with a drive sprocket in the endless track of a track-type machine.

30. (Previously Presented) The track pin bushing of claim 27, wherein a Vickers hardness of the wear-resistant coating is greater than 950 HV.

31. (Previously Presented) A track pin bushing for cooperating with a track pin in an endless track, the track pin bushing comprising:

a tubular body formed of an iron-based alloy with a first end and a second end, an outer surface, and an inner surface having an inner diameter, wherein the inner diameter defines the circumference of an axial bore extending from

the first end to the second end, the tubular body having a first wear protection region and a second wear protection region,

wherein the first wear protection region includes a carburized portion of the outer surface, and

wherein the second wear protection region includes a wear-resistant coating metallurgically bonded to a non-carburized layer of the tubular body, the wear-resistant coating comprising a fused, hard metal alloy comprising at least 60% iron, cobalt, nickel, or alloys thereof.

32. (New) The track pin bushing of claim 4, wherein the varying diameter of the outer surface includes a first outer diameter at a first end section and a second end section and a second outer diameter at a middle section therebetween, wherein the second outer diameter is greater than the first outer diameter.

33. (New) The track pin bushing of claim 32, wherein the outer surface includes an annular groove located in at least a portion of said middle section and extending over a majority of an axial length of said middle section and wherein the wear resistant coating is disposed in said annular groove.

34. (New) The track pin bushing of claim 32, wherein the track pin bushing is an iron-based alloy and at least one of the first end, second end, inner surface, first end section and second end section is case hardened.